

Benjamin G. Pierce

NSF Graduate Research Fellow at CWRU

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RESEARCH INTERESTS

Photovoltaics Modeling Machine Learning Energy Systems High-Performance Computing

EDUCATION

Case Western Reserve University

PhD. Materials Science and Engineering

Jan 2024 – May 2021

Cleveland, OH

- Advisor: Prof. Roger H. French

University of California San Diego

Ph.D Mechanical Engineering

August 2023 – Jan 2024

La Jolla, CA

- Advisor: Prof. Jan Kleissl

Case Western Reserve University

B.S. Computer Science; GPA: 3.6

Aug 2017 – May 2021

Cleveland, OH

EXPERIENCE

Sandia National Laboratories

[Member of the Technical Staff](#), R&D Systems Engineering

October 2021 - June 2023

Albuquerque, NM

- Used sky images and novel sensors to forecast and nowcast cloud coverage and irradiance for SATs.
- Modeled PV performance for continental US for factors including terrain slope, shading, and degradation.
- Used Sandia High Performance Computing clusters to accelerate R&D for multiple projects.

Sandia National Laboratories

Student Intern

May 2020-October 2021, Sep 2023-Current

Albuquerque, NM

- Devised novel control algorithms for single axis trackers (SATs), resulted in submitted patent application and DOE funding.

Solar Durability and Lifetime Extension Center

[Research Assistant](#)

Aug 2018 – May 2021

Cleveland, OH

- Used image processing to find the rate of crystallization of AlN on a molten Al-Ni alloy.
- Utilized unsupervised machine learning to sort electroluminescence images based on defects and/or damage.
- Investigated electrical impact of cracks on Si PV cells.

PUBLICATIONS

- M. Adachi, S. Hamaya, D. Morikawa, **B. G. Pierce**, A. M. Karimi, Y. Yamagata, K. Tsuda, R. H. French, H. Fukuyama, “Temperature dependence of crystal growth behavior of AlN on Ni-Al and demonstration of thick AlN film growth using electromagnetic levitation and computer vision technique” in Materials Science in Semiconductor Processing, 1/1/2023 [[Online](#)]

- B. G. Pierce, J. L. Braid, J. S. Stein, and D. Riley, "Cloud Segmentation and Motion Tracking in Sky Images," IEEE J. Photovoltaics, 10/17/2022, [[Online](#)]
- B. G. Pierce, J. L. Braid, J. S. Stein, J. Augustyn, and D. Riley, "Solar Transposition Modeling via Deep Neural Networks With Sky Images," IEEE J. Photovoltaics, 11/22/2021 [[Online](#)]
- C. M. Whitaker, B. G. Pierce, R. H. French, and J. L. Braid, "Properties of PV Cell Fractures and Effects on Performance of Al-BSF and PERC Modules," in IEEE 48th Photovoltaic Specialists Conference, 6/6/2021 [[Online](#)]
- B. G. Pierce, A. M. Karimi, J. Liu, R. H. French, and J. L. Braid, "Identifying Degradation Modes of Photovoltaic Modules Using Unsupervised Machine Learning on Electroluminescence Images," in 2020 47th IEEE Photovoltaic Specialists Conference, 6/15/2020 [[Online](#)]
- C. M. Whitaker, B. G. Pierce, A. M. Karimi, R. H. French, and J. L. Braid, "PV Cell Cracks and Impacts on Electrical Performance," in 47th IEEE Photovoltaic Specialists Conference, 6/15/2020 [[Online](#)]
- A. M. Karimi, J. S. Fada, N. A. Parrilla, B. G. Pierce, M. Koyutürk, R. H. French, and J. L. Braid. "Generalized and Mechanistic PV Module Performance Prediction from Computer Vision and Machine Learning on Electroluminescence Images," IEEE J. of Photovoltaics, 3/30/2020 [[Online](#)]

INTELLECTUAL PROPERTY

- J. Stein, J. L. Braid, B. G. Pierce, and D. Riley, "Systems and methods for single-axis tracking via sky imaging and machine learning comprising a neural network to determine an angular position of a photovoltaic power system," US 11,823,409 B1, Nov. 21, 2023 [[Online](#)]

PRESENTATIONS

- "Approaches to Sky Image Based Single Axis Tracker Algorithms," presented at the 2022 15th PV Performance Modeling Workshop, Salt Lake City, UT. [[Online](#)]
- "Cloud Segmentation and Motion Tracking in Sky Images," presented at IEEE PVSC 2022
- "Solar Transposition Modeling via Deep Neural Networks With Sky Images," presented at IEEE PVSC 2021

AWARDS & HONORS

NSF Graduate Research Fellow	National Science Foundation
Awarded prestigious NSF GRFP fellowship for graduate school funding.	April 2023
IEEE PVSC 2022 Session Chair	IEEE PVSC
Co-chair for Solar Resource and PV Forecasting, Session II	June 2022
Computer and Data Sciences Research Award	CWRU
To the graduating senior demonstrating exceptional research potential	May 2021
Herbold Scholar	CWRU
Awarded funding for Master's program at CWRU, declined for full-time position at Sandia	May 2021
DOE Science Undergraduate Laboratory Internships (SULI)	Lawrence Berkeley National Lab
Offered SULI funding for Summer 2020, declined for Sandia internship	May 2020

TECHNOLOGIES

Programming Languages	Python, R, Julia, C, Java, bash
Libraries	PyTorch, TensorFlow, NumPy, sklearn, pandas, pvlib-python
Laboratory Equipment	Eternalsun Spire, electro/photoluminescence, Suns V_{oc} , breadboard electronics, etc.
Databases	Hadoop2/Hbase, MySQL, MS SQL Server, SQLite
Other	High-performance computing, L ^A T _E X

ACTIVITIES

Association for Computing Machinery	Student Member, 2019
Institute of Electrical and Electronics Engineers	Student Member, 2020
Study Abroad	Cape Town, South Africa, Summer 2018
Volunteer Teaching Correspondent	Prison Mathematics Project , Summer 2021-